INCREASED USE OF FERTILIZER ESSENTIAL TO SUCCESS OF FOOD PRODUCTION PROGRAM

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American agriculture, like industry, has been establishing new high production records annually since the outbreak of the war. Production last year exceeded that of the banner year of 1942, and was about nine percent above the average for the moderately favorable crop seasons of 1937-41. Acre yields were five percent better and four and one-half percent more acres were harvested in 1943 than the average for this five-year period. As the war grows in destructiveness, more and greater demands are being made to push farm production to higher and higher levels.

Fertilizer has played an important part in enabling the farmers to obtain the high level of production that has been maintained during the past few years. This fact is amply brought out in table 1.

Table 1 - Estimated Acreage Fertilized, Total Amount of Fertilizer Used, and Rate Applied per Acre; Total Production from Fertilizer, Additional Crop Yield Per Ton of Fertilizer, and Portion of Production Produced by Fertilizer; and the Number of Additional Acres of Land That Would Have Been Necessary to Produce Yields Equivalent to Those Produced by Fertilizer by Major Crops for 1942

Crop	Acres Fertilized (000)	Fertilizer Used (Tons)	Rate Per Acre (Lbs)	Yield Produced by Fertilizer (000 Units)	Yield from One Ton of Fertilizer (Units)	Protein of Crop Produced by Fertilizer (Percent)	Acres Replaced by Fertilizer (000)
Cotton	10,420	1,460,623	280	2,921 bales	2 bales	22.5	11,000
Corn	21,543	2,203,900	205	275,488 bu.	125 bu.	8.7	14,000
Wheat	6,659	780,300	234	66,326 bu.	85 bu.	2.7	5,000
Potatoes	1,533	708,650	925	131,100 bu.	185 bu.	35.3	1,500
Tobacco	1,203	536,400	892	734,868 lbs.	1,370 lbs.	51.9	1,500
Oats	4,930	496,200	201	69,468 bu.	140 bu.	5.1	3,000
Sweet Potatoes	497	148,700	599	42,380 bu.	285 bu.	64.8	1,000

It can be seen from the above table that fertilizer was an important factor in bringing about increased yields with each of the crops listed, and that its total influence on production was considerable. It is also of interest to note that in order to obtain equivalent production without the use of fertilizer an additional 37,000,000 acres of land would have been needed.

The production goals set for many important crops are tempered by restrictions imposed by the limitations in production facilities including scarcity or non-existence of additional suitable land. They are further restricted by being keyed to average acre yields under present operating conditions. This means that, unless relief can be had by the introduction of other factors, there is an upper limit beyond which we cannot go.

Since the farmer is now pushed to the approximate limit on the number of acres he can manage with the labor and machinery at his command, any further substantial increases in crop production must come in the form of vertical expansion that is from increased yields on the acres now in use. Abundant evidence is available showing that the use of lime and fertilizer affords a satisfactory means for accomplishing this goal by increasing present acre yields and total production. This fact is clearly brought out in table 2 which contains 15 years results with the use of varying amounts of a complete fertilizer (4-9-2) on the yield of corn and wheat and the estimated labor requirements for handling the crops in North Carolina.

Table 2 - Effect of Varying Amounts of Fertilizer on the Yield and Labor Requirements of Corn and Wheat

Rate Fertilizer Applied	Yield of Corn	Additional Yield for Each 150 Pounds of Fertilizer	Estimated Labor Requirements	Yield of Wheat	Additional Yield for Each 150 Pounds of Fertilizer	Estimated Labor Requirements
(Lbs.)	(Bu.)	(Bu.)	(Man Hrs.)	(Bu.)	(Bu.)	(Man Hrs.)
None	12.8		38.7	2.75		20.4
150	22.55	9.75	44.2	12.15	9.40	22.4
300	30.35	7.80	48.2	18.05	5.90	24.4
450 *	33.25	2.90	50.2	22.65	4.60	26.4
600	34.50	1.25	51.2	24.25	1.60	27.4
750	36.05	2.05	52.2	25.90	1.65	28.4
* Increase	160%		30%	724%		29%

It can be seen from the above table that the yields of both corn and wheat were increased significantly by the use of fertilizer. Noticeable increases for both crops were obtained from each of the first three 150-pound increments. The increases, though less pronounced, carried through the 750-pound application. The total increase in yield amounted to approximately 200 percent for corn and over 800 for wheat. To put it another way, under present operating conditions, two additional acres would have been needed to equal the production resulting from the use of 750 pounds of fertilizer on corn and eight acres for wheat.

Table 2 also brings out the fact that fertilizer is a labor saving factor. The 450-pound application increased the yield of corn 160 percent in comparison with only a 30 percent increase in labor requirement. The same rate applied to wheat resulted in a crop increase of 724 percent as against

a 29 percent increase in labor requirements. In other words, had the 36 bushels of corn been produced without the aid of fertilizer, two additional acres of land would have been required and the labor requirement would have been 116 man hours instead of 52 to say nothing of the extra power and farm machinery that would have been needed to cultivate the two additional acres.

Other crops respond to the use of fertilizer as readily as corn and wheat. The average of a number of tests on cotton in several southeastern States in which varying amounts of fertilizer were used shows that unfertilized land produced 433 pounds of seed cotton per acre while the same type of land receiving 300, 600, 900 and 1200 pounds of fertilizer produced 976, 1175, 1344 and 1525 pounds of seed cotton, respectively. Similar tests in the same area with sweet potatoes show yields of 86 from unfertilized land and 125, 144 and 168 bushels from similar land receiving 500, 750 and 1000 pounds of fertilizer, respectively. Results with the use of fertilizer on potatoes in Maine bring out the same fact. The yields there were 117 bushels for unfertilized land in comparison with 251, 326, 374, 496, and 425 bushels from the use of 500, 1000, 1500, 2000, and 3000 pounds of fertilizer, respectively.

Here as with corn and wheat fertilizer proved a decided labor saving factor. The maximum rates used on octton and sweet potatoes produced crop increases amounting to 252 and 95 percent, respectively, in comparison with corresponding increases in labor requirements of only 60 and 33 percent. In case of the 2000-pound rate with potatoes, the increase was 247 for yield and 30 percent for labor.

The beneficial effects of fertilizer are not restricted to any one section of the country. Over a three-year period in Ohio unfertilized corn produced 26.3 bushels in comparison with yields of 34.5, 37.7 and 38.9 bushels from the use of 100, 200 and 400 pounds per acre of a 3-12-4, respectively.

The use of fertilizer effects even a greater economy in the use of farm machinery than has been shown to be the case with labor. In neither of the above-mentioned cases would appreciable amounts of additional farm machinery be needed. A fuller use of that already on hand would be sufficient to take care of the additional yields because farmers guage their machinery requirement by the number of acres in use and not by the expected yield. It takes no more machinery to harvest a 100-bushel acre yield of potatoes than a 200 one and the larger yield can be harvested just about as rapidly as the smaller insofar as machinery is concerned.

Present production of much of our farm land is at a relatively low level in comparison with yields that can be had throughout most of the humid section of the country with the use of fertilizer. The possibility of increasing crop yields from the use of fertilizer is further indicated in table 3 which shows the yields for a few of the major crops that may be expected from the use of one ton of nitrogen, phosphoric acid or potash.

Table 3 - Production Resulting from the Use of One Ton of Nitrogen (N), Phosphoric Acid (P_2O_5), or Potash (K_2O)

Crop	Nitrogen	Phosphoric Acid	Potash
	(Tons)	(Tons)	(Tons)
Corn	20	9	15
Wheat	15	12	10
Barley and Oats	25	6	10
Forage	30	30	25
Sweet Potatoes	37	18	41
Potatoes	40	23	50
Vegetables	40	30	45
Soybeans			3
Peanuts		6	7

The extra production from the use of fertilizer can be had at a nominal cost in comparison with that of obtaining equivalent amounts from additional acres. The chief item involved in the former is that of the fertilizer and the slight additional cost involved in harvesting the increased yields. The small amount of additional labor and machinery involved in applying the fertilizer and harvesting the increased production is infinitesimal in comparison with that required to cultivate the additional acres needed to obtain equivalent output.

Thus far crops are not being fertilized at a sufficiently high rate to secure maximum production. Perhaps exceptions to this rule may be found with celery in Florida, potatoes in Florida and Maine, the highly developed trucking areas along the Atlantic Coast including Long Island, and other intensively fertilized crops and areas. On the other hand, the majority of the crops in the humid section fall short of this mark. Too often the practice is to fertilize at the lower limit of the scale rather than at the level that will yield maximum net gain. Such important crops as corn and wheat for instance could be fertilized much heavier in the majority of cases than is customary and in others they go unfertilized. The same is true with other crops in varying degrees.

The opportunity for increasing production of cultivated crops by expanding the use of fertilizer is great, as has been pointed out. However, another highly satisfactory way to contribute to the food production program now is through the expansion of the use of fertilizer on forage crops. This will afford immediate and direct relief to the critical livestock feed problem. Perhaps not more than five percent of the hay and pasture land of the Nation is fertilized. Much of what is fertilized does not receive adequate amounts.

The importance of the use of fertilizer in boosting the production of forage on hay and pasture lands is amply proved by the results obtained. The average pasture yields for 20 States were more than doubled by the addition of plant food averaging that contained in 300 pounds of a 4-12-5 fertilizer.

The average yield for unfertilized pastures was 2129 pounds of dry forage compared with 4362 pounds for the fertilized. The only extra labor involved in producing the additional 2233 pounds of forage was the small amount required to apply the fertilizer. The forage from the fertilized pasture is also superior in quality to that from the unfertilized. Similar results have been had from the application of fertilizer to hay lands in about 40 States. The amount of additional labor involved here, too, is negligible. Only enough is required to harvest the increased production. The amount involved is far less than that needed to produce an equivalent amount of hay any other way. Here, as with pastures, forage of superior quality is produced on the fertilized meadows.

According to the most accurate information, there is a dangerous deficit in both forage and concentrate supplies for the present large numbers of livestock. This situation is so critical that the War Food Administration has recommended a reduction in livestock numbers despite the fact that the needs for livestock and livestock products are so great that they cannot be supplied even with present numbers.

Table 4 shows the requirements, supplies, surpluses and deficits of forage and concentrates. The figures show a deficit of over 22,000,000 tons of forage and 8,800,000 tons of concentrates for the entire country. There are serious deficits in two of the regions for forage and in three for concentrates. Two regions show surplus of forage and concentrates. Only the Western shows a worthwhile surplus of both forage and concentrates. However, even though a region may show a surplus of either type of feed, there still exists critical areas within the region.

Table 4 - Requirements, Supplies, Surpluses and Deficits of Forage and Concentrates by Regions

Region	Forage			Concentrates 1/		
	Requirements	Supplies	Surpluses or Deficits 2/	Requirements	Supplies	Surpluses or Deficits
	(000 Tons)	(000 Tons)	(000 Tons)	(000 Tons)	(000 Tons)	(000 Tons)
Northeast	20,737	22,438	+1,701	8,007	3,063	-4,944
North Central	131,657	112,092	-19,565	75,753	78,592	+2,839
West North Central	27,340	27,088	- 252	10,268	6,931	-3,337
Southern	81,002	66,222	-14,780	17,558	12,196	-5,392
Western	85,358	95.966	+10,608	11,724	13,704	+1,980
TOTALS	346,094	323,806	-22,288	123,340	114,486	-8,854

1/ Bureau of Agricultural Economics

2/ Based on livestock numbers as of January 1, 1944.

Dairy research shows that it is possible to substitute high quality forage for concentrates up to one-half of the concentrate requirements at a rate of two tons of forage for one of concentrates for dairy cattle, provided a

properly balanced ration, as between forage and concentrates, is being fed. With this in mind it is evident that, if the 1,701,000-ton forage surplus in the Northeast were substituted for concentrates, there would still remain a 4,000,000-ton deficit of concentrates. On the other hand the forage deficit in the North Central Region will result in the uneconomical feeding of concentrates with the view of off-setting the deficit in forage. The small forage deficit in the East Central Region adds to the existing difficulty caused by the 3,000,000-ton deficit of concentrates. The situation in the South is even worse since there is a critical deficit in both forage and concentrates. The West is the only section of the country which has a surplus of both forage and concentrates, but even here there are local deficit areas of one or both of these classes of feed.

Farmers have been requested to reduce livestock in order to bring the number more in line with feed supplies. The present livestock population, large as it is, is still insufficient to meet our needs. If the number were decreased there would still remain the problem of getting adequate feed for those remaining. Livestock, dairy and poultry products constitute an important part of our American diet. These products represent fully two-fifths of our total food requirements; three-fifths of our requirements for protein and phosphorus; and four-fifths of our requirements for calcium.

Hay and pasture is the principal source of feed for cattle, sheep, horses and mules. Hay and pasture account for more than three-fifths of the feed consumed by horses and mules; more than three-fourths of that consumed by dairy cows; four-fifths of that consumed by other cattle; and nine-tenths of the feed consumed by sheep. In many States feed from pasture can be produced at less than one-half of the cost of corn and at less than one-third of the cost of oats. Good hay can be produced in those States far cheaper than either corn or oats. There are greater opportunities to increase hay and pasture production than feed grains. Practically all the land suitable to grain production not now in other use is already devoted to this use, and grain crops are more heavily fertilized on the average than forage crops. Thus, any expansion of the acreage devoted to grain production must be at the expense of hay or pasture crops and any increases in yields per acre from the use of fertilizer will be more expensive than similar increases from forage crops. In addition, it requires much less labor to produce forage than grain.

By adopting certain improved practices, such as the application of lime and fertilizers on hay and pasture and by the increased use of supplementary pastures, the forage supplies can be substantially increased. The amount of superphosphate needed for application of 100 pounds per acre annually to the recommended minimum acreage, together with the estimated tonnage of forage that may be expected to result, is shown by regions in table 5.

Table 5 - Deficit or Surplus of Forage, Tons of 18 Percent Superphosphate Required to Apply 100 Pounds Annually to Minimum Recommended Acreage and Additional yields of Forage That Could Be Expected

Region	Deficits or Surpluses of Forage	18% Superphosphate Needed to Apply 100 Pounds Annually to Minimum Recommended Acreage	Additional Expected Yields of Forage from Superphosphate
	(000 Tons)	(000 Tons)	(000 Tons)
Northeast	+ 1,701	777	4,197
North Central	-19,565	3,117	16,832
East Central	- 252	1,416	7,646
Southern	-14,780	1,562	8,435
Western	+10,608	532	2,870
TOTALS	-22,288	7,404	39,980

The use of 7,404,000 tons of 18 percent superphosphate would result in the production of nearly 40,000,000 additional tons of forage. This would be only a little more than enough to make up the 22,000,000 deficit and the 17,000,000 tons that could be substituted for the 8,800,000 tons deficit in concentrates reported in table 5. These two items do not represent the total amount of forage that could be used by the present livestock numbers; however, for over 42,000,000 tons could be substituted for concentrates. This latter figure added to the actual 22,000,000-ton forage deficit would make a total of 62,000,000 tons that could be used. In light of this fact the 40,000,000 tons would fall short by 22,000,000 of the amount that could be used in our present livestock program. This latter item is shown by regions in table 6.

Table 6 - The Amount of Forage That Could Be Substituted for Concentrates by Regions

Region	Amount of Forage that could be substituted for concentrates
	(1,000 Tons)
Northeast	4,265
North Central	24,160
East Central	3,429
Southern	5,963
Western	4,525
TOTAL	42,342

Even though the use of fertilizer on pasture and hay crops may produce more immediate results and forage is a satisfactory substitute for

concentrates within certain limits the needs for additional amounts of both forage and concentrates are so great that it is essential that advantage be taken of every means available for increasing both classes of feed. In fact the same holds true for all food crops. Because of these facts, the amounts of plant food needed for 1944-45 are much greater than for any previous year and substantial additional amounts are needed on all grain crops as well as forage.

The amounts of plant food deemed necessary for the 1944-45 crop production program are set out in three categories in table 7.

Table 7 - The Amount of Nitrogen (N), Phosphoric Acid (P_2O_5) and Potash (K_2O) Needed for 1944-45

Categories	Nitrogen	Phosphoric Acid	Potash
	(Tons)	(Tons)	(Tons)
Normal Use	725	1,250	745
Additional for:			
Forage Crops	300	720	150
Grain & Other crops	356	400	200
TOTALS	1,381	2,370	1,095

The amount of plant food indicated as being needed for normal use in table 7 is the amount that is needed for ordinary crop uses and represents the amount that is expected to flow through regular commercial channels without outside stimulus. The amounts set up for forage can be effectively used on hay, pasture and temporary forage crops to make up not only the existing forage deficit but to produce additional supplies which will permit an expansion of the livestock program. The third item, grain and other crops, indicates amounts over and above the other items that are needed to bring production to a sufficiently high level to enable American agriculture to attain the production goals sorely needed at this time.

The suggested use of that representing "normal use" is set up by major crops in table 8.

Table 8 - The Suggested Distribution of That Plant Food Representing Normal Use by Major Crops

Crop	Nitrogen	Phosphoric Acid	Potash
	(Tons)	(Tons)	(Tons)
Cotton	136,704	127,247	85,793
Corn	137,048	176,159	88,950
Potatoes	52,213	97,626	79,974
Wheat	42,572	144,951	80,220
Barley	2,733	5,227	3,094
Oats	33,121	37,755	23,294
Rye	1,343	2,817	1,471
Tobacco	35,647	65,211	56,790
Vegetables	96,870	148,868	110,049
Fruits and Nuts	76,572	35,130	41,166
Sweet Potatoes	16,894	41,687	27,077
Soybeans	0	46,268	31,594
Peanuts	11,008	63,151	33,268
Sugar	14,719	28,950	5,098
Forage	13,000	129,960	12,000
Victory Gardens & Miscellaneous	18,900	83,463	41,973
Sub Total	689,344	1,234,470	721,811
Hawaii	17,206	7,823	12,009
Puerto Rico	18,450	7,707	11,180
TOTALS	725,000	1,250,000	745,000

The items listed under "Forage" in table 7 are considered essential to the successful solution of the tight forage situation relative to our livestock program. The 300,000 tons of nitrogen can be expected to produce about 9,000,000 tons of high quality forage. Nitrogen produces immediate results when applied to forage crops and its use would give prompt relief in the way of increased forage supplies. Of the 720,000 tons of phosphoric acid suggested about 180,000 tons are already being used. An increase of 540,000 tons over present usage would result in the production of an additional 16,200,000 tons of forage. The 150,000 tons of potash would also account for some 3,750,000 tons more forage. The total additional forage produced from the use of the three materials would be about 28,950,000 tons.

The suggested use of these materials, together with anticipated production, by regions appears in table 9.

Table 9 - Suggested Use of the 300,000 Tons of Nitrogen, 540,000 Tons 1/ of Phosphoric Acid and 150,000 Tons of Potash, and the Estimated Production of Forage by Regions

Region	Nitrogen	Forage	Phosphoric Acid	Forage	Potash	Forage	Total Forage
	(Tons)	(Tons)	(Tons)	(Tons)	(Tons)	(Tons)	(Tons)
Northeast	32,242	967,260	56,669	1,700,070	17,377	434,425	3,101,755
North Central	128,850	3,865,500	227,330	6,819,900	69,571	1,739,275	12,424,675
East Central	58,731	1,761,930	103,281	3,098,430	31,625	790,625	5,650,985
Southern	58,267	1,748,010	113,920	3,417,600	31,427	785,675	5,951,285
Western	21,910	657,300	38,800	1,164,000	0	0	1,821,300
TOTALS	300,000	9,000,000	540,000	16,200,000	150,000	3,750,000	28,950,000

1/ Portion of 720,000 over present usage

Table 9 shows an estimated production of 9,000,000 tons of forage from the use of the 300,000 tons of nitrogen, 16,200,000 from the use of 540,000 tons of phosphoric acid, and 3,750,000 from the use of 150,000 tons of potash, with a total production from the three plant food elements of 28,950,000 tons.

The total estimated production resulting from the use of the additional amounts of fertilizer on forage crops, together with the present indicated balance, appears by regions in table 10.

Table 10 - Present and Revised Balances of Forage, and Anticipated Production from the Use of Fertilizer by Regions

Region	Present Balance	Anticipated Production	Revised Balance
	(000 Tons)	(000 Tons)	(000 Tons)
Northeast	+ 1,701	3,102	+ 4,803
North Central	-19,565	12,425	- 7,140
East Central	- 252	5,651	+ 5,399
Southern	-14,780	5,951	- 9,892
Western	+10,608	1,821	+12,429
TOTALS	-22,288	28,950	+ 6,662

The revised balance in table 10 shows sizeable surpluses of forage in three regions and critical deficits in the two others. The complete picture cannot be had, however, without examining the revised balance for concentrates in table 12.

The 357,932 tons of nitrogen, 400,000 of phosphoric acid, and 200,000 of potash listed in table 7 for grain and other crops would be used on corn, small grain, sweet potatoes, soybeans, and peanuts. The suggested amounts of the three plant food elements for each, the anticipated production, and the number of acres required for equivalent production are given in table 11.

Table 11 - Suggested Use of "Grain and other Crops" Amounts of Nitrogen, Phosphoric Acid, and Potash; Expected Production; and the Acreage Required for Equivalent Production by Crops

Crop	Nitrogen			Phosphoric Acid			Potash			TOTALS	
	Tons	Production: Tons	Acres for Equivalent Production: (000)	Tons	Production: Tons	Acres for Equivalent Production: (000)	Tons	Production: Tons	Acres for Equivalent Production: (000)	Production: Tons	Acres for Equivalent Production (000)
Corn	331,960	6,639,200	10,090	200,710	1,684,964	2,561	106,346	1,595,190	2,424	9,919,354	15,075
Wheat	9,458	141,870	335	53,594	643,128	1,520	21,215	212,150	502	997,148	2,357
Rye	814	12,210	41	3,075	36,900	123	1,333	13,330	44	62,440	208
Oats and Barley	15,700	392,500	820	79,077	474,462	991	37,406	374,060	781	1,241,022	2,592
Soybeans				38,117			19,071	49,585	103	49,585	103
Sweet Potatoes				3,639	65,138	29	2,274	93,916	41	159,054	70
Peanuts				21,788	130,728	369	12,355	86,485	244	217,213	613
TOTALS	357,932		11,286	400,000		5,593	200,000		4,139		21,018

It can be seen from table 11 that the use of 357,932 tons of nitrogen produce as much as 11,286,000 acres with present practices. Similarly, application of 400,000 tons of phosphoric acid and 200,000 tons of potash result in production that is equal to that from 5,593,000 and 4,139,000 acres, respectively, under present operating conditions. The production resulting from the use of these materials is equal to that now being produced on a total of 21,018,000 acres.

The total production of grain listed in table 11 and the present and revised concentrate balances are given by regions in table 12.

Table 12 - Present Balance, Anticipated Production Resulting from use of Fertilizer, and Revised Balance of Concentrates by Regions

Region	Present Balance (000 Tons)	Anticipated Production (000 Tons)	Revised Balance (000 Tons)
Northeast	-4,944	776	-4,168
North Central	+2,839	3,831	+6,670
East Central	-3,337	2,811	- 526
Southern	-5,392	4,716	- 676
Western	+1,980	85	+2,065
TOTALS	-8,854	12,220	+3,365

Table 12 shows a total production of over 12,000,000 tons of grain from the use of plant nutrients. The revised concentrate balance shows a shift from more than an 8,800,000-ton deficit to an overall surplus of better than 3,300,000 tons. Despite this overall surplus there still would be a large deficit of concentrates in the Northeast Region and smaller ones in East Central and Southern. Now to get a more complete picture of the feed situation as a whole, it will be necessary to examine the revised balances for both forage and concentrates. These are shown in table 13 along with one for the entire feed situation.

Table 13 - Revised and Final Balances of Forage and Concentrates

Region	Revised Balance		Final Balance	
	Forage (000 Tons)	Concentrates (000 Tons)	Forage (000 Tons)	Concentrates (000 Tons)
Northeast	+4,803	-4,168	-----	-1,767
North Central	-7,140	+6,670	-7,140	+6,670
East Central	+5,399	- 526	+4,247	-----
Southern	-9,892	- 676	-9,892	- 676
Western	+12,429	+2,065	+12,429	+2,065
TOTALS	+ 5,599	+3,365	+ 356	+6,292

The revised balances in table 13 show a surplus of both forage and concentrates for the country as a whole which makes additional livestock possible. However, this is not uniform over the several regions. Critical deficits of forage still remain in the North Central and Southern Regions. There is also a critical concentrate situation in the Northeast. Slight deficits in concentrates appear in the East Central and Southern Regions. The final balances in the same table were arrived at by substituting forage for concentrates, at the rate of two units of the former for one of the latter, where conditions permitted. After these adjustments were made, the situation in the country at large is satisfactory. However, the Northeast is still

confronted with a concentrate problem and the North Central has its forage difficulties, while the East Central and Western Regions appear to be in good shape. The Southern, on the other hand, is still short 9,892,000 tons of forage as well as over a half million tons of concentrates.

The consumption of fertilizer has increased during the past few years, as is indicated in table 14 which shows the amount of nitrogen, phosphoric acid, and potash used by crop years from 1939 to 1943, together with the estimated needs for 1944-45.

Table 14 - Amount of Nitrogen, Phosphoric Acid, and Potash Used by Crop Years from 1939-40 and Estimated Needs for 1944-45

Year	Nitrogen (1,000 Tons)	Phosphoric Acid (1,000 Tons)	Potash (1,000 Tons)
1939-40	413	887	427
1940-41	456	985	461
1941-42	420	1,044	521
1942-43	460	1,114	590
1943-44	675	1,260	585
1944-45	1,381	2,370	1,095

There has been a consistent increase in the consumption of phosphoric acid since 1939-40. The same is true for potash with the exception of 1943-44, during which time the amount used is expected to be only slightly below that of the preceding year. The use of nitrogen has been more erratic. Not until the current crop year has there been a worthwhile change in consumption of this element.

During this period the consumption of fertilizer has been definitely related to the amount available for agricultural use. The demand has consistently exceeded the available supplies. Even with considerably more nitrogen and additional phosphoric acid, the situation during the current year is critical in terms of both the demand and the amount that should be used to produce needed food and feed crops. Unless appropriate steps are taken at an early date to substantially increase available supplies, the situation in 1944-45 will be equally acute.

By July 1, 1944, the production of superphosphate is expected to be at the rate of 8,000,000 tons (18 percent basis) annually. Careful estimates show that production capacity could be enlarged for an investment of about eight dollars per ton of capacity. On this basis the capacity could be increased from 8,000,000 to 13,000,000 tons at a total investment of $40,000,000. This program would involve a fuller use of present production facilities as well as the construction of additional acidulating, sulphuric acid producing and rock crushing plants.

The additional 5,000,000 tons of superphosphate thus made available would provide 900,000 tons of phosphoric acid. This would permit the use of some

540,000 tons on hay and pasture crops as well as sizeable quantities for corn and the small grain crops. The critical feed situation, both as to forage and concentrates, warrants the use of even larger quantities. The 336,456 tons of phosphoric acid thus made available for use on grain crops in accordance with the plan outlined in table 11 would account for 2,839,454 tons of grain which would be equivalent to production from an additional 5,195,000 acres of land. The 3,000,000 tons of superphosphate made available for forage crops would produce upwards of 16,000,000 tons of forage. The protein content of this forage would be equivalent to about 5,800,000 tons of 41 percent cotton seed meal.

The 150,000 tons of potash used on hay and pasture crops would add 3,750,000 tons of forage to expected supplies and the 200,000 tons suggested for grain, soybeans, peanuts and sweet potatoes would add 2,194,730 tons of grain, 49,585 tons of soybeans, 93,916 of sweet potatoes, and 86,485 of peanuts, all of which are sorely needed. Since available potash production facilities are running at maximum capacity and the output is falling short of other urgent needs, any additional supplies that may be made available for such use would have to be produced from newly constructed production facilities or imported or both. Such facilities can be had at an investment of $32.00 per ton of production capacity. On this basis the total investment in new facilities to provide this production would be approximately $11,200,000, provided all had to come from domestic supplies. Should imports be increased domestic production could be reduced accordingly.

Additional nitrogen in the amount of 656,000 tons could be used effectively in the livestock feeding program. Of this amount 300,000 tons would go to hay and pasture crop use and the remainder would be used on grain crops. The 300,000 tons used for forage production would account for 9,000,000 tons of forage and the 356,000 tons used on grain crops would account for over 7,000,000 tons of grain. The nitrogen supplies could be made adequate by using domestic production facilities to the maximum and by increasing imports sufficiently.

The total production to be expected from the use of the 656,000 tons of nitrogen, 940,000 tons of phosphoric acid, and the 350,000 tons of potash would be 28,950,000 tons of forage, 12,219,964 tons of grain, 49,585 tons of soybeans, 159,054 tons of sweet potatoes, and 21,213 tons of peanuts. The above indicated amounts of forage and grain would do much to alleviate the feed situation as has been pointed out, and the soybeans, sweet potatoes and peanuts could be added to our inadequate supplies of these crops. To obtain production equivalent to that specified above for grain, soybeans, sweet potatoes and peanuts by cultivating additional land over 21,000,000 acres would have to be added to that now being cultivated. This production can be had for an investment of $51,200,000 for the superphosphate and potash and the cost of shipping for nitrogen. Investments made for such purposes would have more than a wartime value. The use of these fertilizer materials is basic to a sound agricultural and conservation program in peacetime as well as in time of war.

The nation's farmers have already shown their eagerness to cooperate to the full in attaining the production goals set from year to year. They have exceeded expectations each time thus far, but the demands being made on them for still greater and greater production are taxing their land, labor, and machinery resources to the limit. Since fertilizer offers a major means of pushing food production to new heights, and that the supplies are constantly behind the demands, it is imperative that adequate supplies be made available for all essential uses. This is so vital to the success of the food production program to warrant a concerted effort in this direction by the full staffs of all federal, State, and local agencies working on the food and feed program.

March 1, 1944